

Inventions & Innovation Project Abstract

Hydrogen Production via a High-Efficiency Low-Temperature Reformer

Fuel cells are promoted by the U.S. government as a viable alternative for clean and efficient energy generation. Over the past few years, fuel cell and automotive companies have announced new technologies or prototype vehicles adopting fuel cells in an effort to reduce atmospheric pollution. The military has an interest in fuel cell technology for mobile applications due to its portability and quietness. Thus, it is anticipated that the fuel cell market will rise if the key technical barriers can be overcome. One of them is certainly fuel processing and purification. Existing fuel reforming processes are energy intensive, extremely complicated and capital intensive; these disadvantages handicap the scale-down of existing reforming process, targeting distributed or on-board/stationary hydrogen production applications.

Media & Process Technology, Inc. is working on a project that involves the bench-scale demonstration of a high-efficiency low-temperature steam reforming process. Hydrogen production can be operated at 350 to 400°C with our invention, as opposed to >800°C of existing reforming. In addition the residual CO contaminant is expected to be < 10ppm. Due to its extremely high efficiency, the reformer can produce hydrogen product economically at this low temperature. Emerging technologies, such as membrane reactor technology and adsorption-enhanced reactor proposed in the literature are not efficient enough to achieve significant reforming and meet the CO contaminant level at this low temperature. In comparison, Media & Process Technology's reformer offers the advantages below:

- No water-gas-shift (WGS) reactor is required.
- No post treatment for CO clean-up is necessary.
- All heating and cooling requirements involve the temperature range of up to 400 vs. >800°C of existing reforming.
- The low reactor temperature, $\leq 400^{\circ}\text{C}$, offers a tremendous advantage (as opposed to the 800°C of conventional SMR) with regard to quick start-up required for the mobile application.
- The process is ultra-compact.



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